copending applications. The amendment of claim 20 and new claims 63 and 64 are supported by the specification, for example, at page 31, line 23 to page 32, line 10 and at page 48, line 15 to page 49, line 16.

Amendment Of The Specification

Any confusion regarding the amendments to the specification with the Amendment of August 2, 2001 has been corrected by the amendments submitted herewith. Inadvertent errors were made in the page and line numbers of three substitute paragraphs. Corresponding amendments to the specification are correctly submitted in this Amendment and the prior amendments.

Rejections Over JP 61-67836 And Knudsen et al.

The Examiner rejected claims 20-23 under 35 U.S.C. §103(a) as being unpatentable over JP 61-67836 (the JP application) and U.S. Patent 4,957,884 to Knudsen et al. (the Knudsen patent). The Examiner cited the Japanese application for disclosing a fine powder manufacturing apparatus using a laser. The Examiner asserted that the difference between the prior art disclosed in the JP application and Applicants' claims is a recited plurality of reactant inlets. The Examiner cited the Knudsen patent for disclosing a plurality of reactant inlets. The Examiner asserts that it would be obvious to modify the Japanese application's apparatus with the teachings suggested by the Knudsen patent. Applicants believe that there has been a misunderstanding with respect to the Knudsen patent and the intended meaning of Applicants' claims. Applicants have amended claim 20 for clarity. The combined disclosures of the cited references do not alone or together teach or suggest feature(s) of Applicants' claimed invention. Therefore, the references do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the above and following comments.

First, Applicants believe that the Examiner has misunderstood the Knudsen patent. The Knudsen patent only discloses one reactant inlet from tube 6 that is directed toward an outlet. Reactant tubes 32 and 100 are only directed to tube 6. Reactant tubes 32 and 100 do not direct reactants toward a product outlet, as specified in Applicants' claims. Tube 69 delivers an inert argon gas purge, **not a reactant**. See, column 8, lines 50-53. Therefore, neither of the references discloses the claimed plurality of reactant inlets directed to product outlets that lead to a single collector.

For discussion purposes, even if it is assumed arguendo that tube 69 did deliver reactants, the Knudsen patent still would not disclose a plurality of reactant inlets that deliver a plurality of **independent reactant streams**. The independent reactant streams can be within one or more reaction chambers. Applicants' specification describes a plurality of independent reactant inlets in a single reaction chamber at page 31, line 23 to page 32, line 10. Applicants' specification also describes a plurality of separate reaction chambers, each with an independent reactant stream, that are directed to a product outlet that lead to a common collector. See, for example, page 48, lines 7-9 and page 48, line 15 to page 49, line 16.

Since the references alone or together do not teach or suggest multiple independent reactant streams and/or a corresponding product outlet each connected to a common collector, the combined disclosures of the JP application and the Knudsen patent do not render Applicants' claims prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 20-23 under 35 U.S.C. §103(a) as being unpatentable over the JP application and the Knudsen patent.

Rejections Over JP 61-67836 and Beaty et al.

The Examiner rejected claims 20-27, 52 and 56-62 under 35 U.S.C. §103(a) as being unpatentable over the JP application in view of U.S. Patent 5,194,128 to Beaty et al. (the Beaty patent). The Examiner cited the JP application for disclosing an apparatus with a plurality

of reactant inlets. The Examiner asserts that the difference between the disclosure of the JP application and Applicants' claimed invention is the recited particle collection apparatus. The Examiner cited the Beaty apparatus for disclosing two separate particle streams into a single stream that is directed to a collector. The Examiner further asserts that it would be obvious to a person of skill in the art to modify the JP application's teachings with the disclosure of the Beaty patent based on an asserted motivation of the properties and uses expected for the structure and the collection of fine powders from individual sources or for combinations of fine powders. Applicants believe that there is no motivation to combine the references as suggested by the Examiner. Since there is no motivation to combine the references, the combined disclosures do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

The Beaty patent describes an apparatus that **generates** the particles within a reaction chamber from a **solid, stationary source**. Specifically, the particles are generated from ablation of an electrode by a discharge. See, for example, column 2, lines 59-62. The particles are quenched by a carrier gas. See, for example, column 3, lines 1-5. Fig. 3 and the description implies that the particles fragmented from the electrode fill that chamber behind the electrodes. The apparatus in the Beaty patent does not describe a reactant flow for particle formation since the particles are fragmented from a fixed electrode.

In contrast, the JP application is directed to a laser pyrolysis apparatus with flowing reactants. The JP application teaches that a plurality of independent reactant streams that can be used to produce multiple reactants within a single reaction chamber. The stated purpose of using multiple reactant streams is to use the laser radiation more efficiently. See page 4, second full paragraph of the translation. There is no teaching, suggestion or motivation in the JP application to use a single collector to collect product particles from multiple independent reactant streams.

Thus, the JP application involves a single reactor with multiple independent reactant flows, while the Beaty patent involves multiple different reactors that do not have a reactant flow. There is no teaching, suggestion or motivation in the references to combine these different types of technology to form Applicants' claimed invention. Therefore, the references do not render Applicants' claims prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 20-27, 52 and 56-62 under 35 U.S.C. §103(a) as being unpatentable over the JP application in view of U.S. Patent 5,194,128 to Beaty et al. (the Beaty patent).

Rejection Of Claims 53-55

The Examiner rejected claims 53-55 under 35 U.S.C. §103(a) as being unpatentable over the JP application as modified by the Beaty patent, as applied to claims 20-27, 52 and 56-62 above, and further in view of the **Knudsen patent**. Applicants believe that the Examiner inadvertently listed the Beaty patent twice in the statement of the rejection. The Examiner asserts that the Beaty patent discloses the subject matter of claims 53 and 54. The Examiner cited the Knudsen patent for disclosing the proper mixing and/or controlling of the flow rate of each reactant. The Examiner indicated that the disclosure in claim 55 is within the level of ordinary skill in the art. Applicants believe that there is no motivation to combine the references as suggested by the Examiner. Therefore, the references do not render the claims prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

The Knudsen patent and the JP application are directed to laser pyrolysis apparatuses with a single reaction chamber. The flows from individual reactant/product streams proceed to a specific collector for that particular stream. The Beaty patent describes particles eroded from an electrode within a reaction chamber. Since there is no reactant flow in the Beaty apparatus as described and claimed by Applicants, the flow in the Beaty reaction chamber is

inherently different from the flow in a laser pyrolysis apparatus. There is no teaching, suggestion or motivation in the references for the substitution of a laser pyrolysis reactor for the spark chamber disclosed by the Beaty patent. Therefore, the combined disclosures do not lead to Applicants' claimed invention and do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 53-55 under 35 U.S.C. §103(a) as being unpatentable over the JP application as modified by the Beaty patent, as applied to claims 20-27, 52 and 56-62 above, and further in view of the Knudsen patent.

CONCLUSIONS

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested.

The Examiner is invited to telephone the undersigned if the Examiner believes it would be useful to advance prosecution.

Respectfully submitted,

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Peter S. Dardi

ATTACHMENT
MARKED-UP AMENDMENT

Specification As Amended
At page 14, lines 20-28, the paragraph has been amended as follows:

The reaction systems described herein are designed for the efficient production of commercial quantities of particles. Various embodiments of high production rate reaction systems are described in copending and commonly assigned patent application serial No. 08/808,850 now U.S. Patent 5,958,348, entitled "Efficient Production of Particles by Chemical Reaction," filed on February 28, 1997, incorporated herein by reference. Alternative and complimentary embodiments are described herein.

At page 15, lines 11-25, the paragraph has been amended as follows:

Improved aerosol delivery apparatuses for reactant systems are described further in copending and commonly assigned U.S. Patent Application Serial Number 09/188,670 to Gardner et al. now U.S. Patent 6,193,936, entitled "Reactant Delivery Apparatuses," incorporated herein by reference. These aerosol delivery systems can be adapted for use in reaction systems not involving laser pyrolysis. Approaches are also described therein for the adaptation of aerosol delivery by a variety of approaches with a reaction chamber elongated in one dimension in the plane perpendicular to a reactant stream. Some of these approaches include, for example, using an elongated nozzle opening, placing columns of gas jets adjacent the aerosol nozzle, employing a plurality of aerosol nozzles and applying a combination thereof.

At page 19, line 33 to page 20, line 21, the paragraph has been amended as follows:

Referring to Fig. 3, an alternative embodiment of reactant delivery apparatus 102 is shown for delivery of two aerosol reactants. Aerosol generators 146, 148 deliver aerosol into

delivery tubes 150, 152, respectively. Delivery tubes 150, 152 deliver reactants to two openings 154, 156, respectively. Aerosol generators 146, 148 can operate based on a variety of principles. For example, the aerosol can be produced with an ultrasonic nozzle, with an electrostatic spray system, with a pressure-flow or simplex atomizer, with an effervescent atomizer or with a gas atomizer where liquid is forced under significant pressure through a small orifice and fractured into particles by a colliding gas stream. Suitable ultrasonic nozzles can include piezoelectric transducers. Ultrasonic nozzles with piezoelectric transducers and suitable broadband ultrasonic generators are available from Sono-Tek Corporation, Milton, NY, such as model 8700-120. Suitable aerosol generators are described further in copending and commonly assigned, U.S. Patent Application Serial No. 09/188,670 to Gardner et al. now U.S. Patent 6,193,936, entitled "Reactant Delivery Apparatuses," incorporated herein by reference.

Claims As Amended

Claim 20 has been amended as follows:

20. (Amended) A particle production system comprising:

a plurality of reactant inlets configured to direct a plurality of independent reactant streams toward one or more product outlets; and

a particle collection apparatus connected to the one or more product outlets to collect the product particles generated by the reactants from the plurality of reactant inlets.

New claims 63 and 64 have been added as follows:

63. (New) The particle production apparatus of claim 20 wherein a radiation pathway intersects each of the independent reactant streams.

64. (New) The particle production apparatus of claim 20 wherein a single radiation pathway intersects the plurality of independent reactant streams.